|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Equations and Inequalities** | | | | | | | Semester this  will be taught: **1** |
| **Enduring Understanding:** The ability to solve equations and inequalities allows one to find an unknown quantity. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 3: Algebraic Representations** | HS PO 1. Create and explain the need for equivalent forms of an equation.  **HS PO 2. Solve formulas for specified variables.** |  | **1/1** | What does solving for the variable really mean?  How are inverse operations used to solve equations?  How are solutions of an equation related to the graph of the function? |  | Ch 1.1-1.6 |  |
| **Strand 1: Number and Operations**  **Concept 1: Number Sense** | HS - PO 1. Justify with examples the relation between the number system being used (natural numbers, whole numbers, integers, rational numbers and irrational numbers) and the question of whether or not an equation has a solution has a solution in that number system. |  | **1/1** |
| **Concept 2: Numerical Operations** | HS - PO 1. Solve word problems involving absolute value, powers, roots, and scientific notation.  HS PO 2. Summarize the properties of and connections between real numbers operations; justify manipulations of expressions using the properties of real number operations. |  | **1/1** |

**Key Concepts: Key Vocabulary:**

Solve:

Solve:



For compound inequalities, *and* is intersection, *or* is union.

When you multiply or divide an inequality by a negative number, the inequality sign must be reversed.

Whatever is done to one side of an equation or inequality must be done to the other.

Absolute value of a number is the number of units it is from zero on the number line.

Verbal expressions can be translated into algebraic expressions.

Real numbers can be classified as rational (Q) or irrational (I).

Rational numbers can be classified as integers (Z), whole numbers (W), natural numbers (N).

Solve: 

**Examples:**

**Essential Question(s):**

What does solving for the variable really mean?

How are inverse operations used to solve equations?

How are solutions of an equation related to the graph of the function?

**Enduring Understanding:** The ability to solve equations and inequalities allows one to find an unknown quantity.

Equation

Solution

Absolute value

Empty set

Extraneous Solution

Set builder notation

Compound inequality

Intersection

Union

TOPIC:

**Equations and Inequalities**

Solve:



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TOPIC: Linear Relations and Functions** | | | | | Semester this  will be taught: **1** |
| **Enduring Understanding:** Functions and relations are critical to the development of algebraic concepts. They allow us to model real life situations and analyze them. | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **Essential Questions** | | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 2: Functions and Relationships** | ***PO 1. Express and solve problems that can be modeled using linear, quadratic, logarithmic, exponential, cubic, reciprocal, absolute value, and step and other piecewise-defined functions; interpret their solutions in terms of the context.*** |  | What is the difference between a function and a relation?  What is a piecewise function?  What are the domain and range of a function? | Ch 2.2, 2.4,2.6, |  |
| HS – PO 2. Determine if a relationship represented by an equation, graph, table, description, or set of ordered pairs is a function.  ***PO 2. Use function notation flexibly and evaluate a function at a value represented by an algebraic expression.***  HS – PO 3. Use function notation; evaluate a function at a specified value in its domain.  ***PO 3. Graph absolute value, and step and other piecewise-defined functions identifying their key characteristics.*** |  | Ch 2.1, |
| Ch 2.6, 2.8 |
| **Concept 3: Algebraic Representations**  **Concept 4: Analysis of Change** | HS – PO 3 Write an equation given a table of values, two points on the line, the slope and a point on the line, or the graph of the line.  ***PO 1. Analyze and describe how a change in an independent variable leads to a change in a dependent variable.***  ***PO 2. Identify patterns in a function’s rate of change, including intervals of increase, decrease, and constancy; if possible, relate them to the function’s verbal description or its graph.***  ***PO 4. Compare relative magnitudes of functions and their rates of change.***  HS – PO 1. Determine the slope and intercepts of the graph of a linear function, interpreting slope as a constant rate of change.  HS – PO 2. Solve problems involving rate of change. | Ch 2.4  Ch 2.1  Ch 2.3  Ch 2.3 |
| **Strand 4: Geometry and Measurement**  **Concept 3: Coordinate Geometry** | HS – PO 6. Describe how changing the parameters of a linear function affect the shape and position of its graph. |  | Ch 2.7 |
| **Strand 2: Data Analysis, Probability, and Discrete Mathematics**  **Concept 1: Data Analysis** | ***PO 8. Draw a line of best fit for a scatterplot with or without technology, describe how the correlation coefficient relates to fit, and explain when it is appropriate to use the regression equation to make predictions.*** |  | Ch 2.5 |

**Key Concepts: Key Vocabulary:**

Find  when



Graphs of inequalities may have solid or dashed boundaries. The half plane that is the solution is shaded.

Translations, reflections, and dilations to a parent graph form a family of functions.

A piecewise defined function is made up of two or more expressions.

Linear equations can be written in the following forms:

Slope intercept:



Standard: , where A, B, and C are integers, and A > 0.



Point slope:



A line of regression can be used to model data.

Write an equation for the line passing through



Construct a scatter plot, a line of best fit, and describe the correlation for a set of data.

For 

1. Determine if 1-1
2. Find the domain and range

**Examples:**

**Essential Question(s):**

What is the difference between a function and a relation?

What is a piecewise function?

What are the domain and range of a function?

**Enduring Understanding:** Functions and relations are critical to the development of algebraic concepts. They allow us to model real life situations and analyze them.

A function is a relation where each member of the domain is paired with exactly one member of the range.

Bivariate data

Dependent variable

Variation

Independent variable

Line of fit

Correlation

Parent function

Piecewise function

Regression line

Scatter plot

Step function

Transformation

Vertical line test

TOPIC:

**Linear Relations and Functions**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Systems of Equations and Inequalities** | | | | | | | Semester this  will be taught: **1** |
| **Enduring Understanding:** A system of equations allows us to solve problems where there are two or more unknowns. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 3: Algebraic Representations** | ***PO 3. Solve systems of three linear equations in three variables with or without technology*** |  | **1/1** | What are the different methods for solving a system of equations or inequalities, and when would you use each method? |  | Ch 3.1 – 3.3 and Ch 3.5  including exts Ch 3.1, Ch 3.3 |  |
| **Strand 4: Geometry and Measurement** Concept 3: Coordinate Geometry | ***PO 1. Graph the solution set of a system of two or three linear inequalities and given an ordered pair determine whether it is a solution to the system.*** |  | **1/1** |
| **Strand 5: Structure and Logic**  **Concept 2: Logic, Reasoning, Problem Solving, and Proof** | ***PO 2. Solve problems by using theorems, formulating one or more strategies, applying the strategies, verifying the solution(s), and communicating the reasoning used to obtain the solution(s).*** |  | **1/1** |
| **PO 11. Determine under what conditions a given statement (algebraic, geometric) is true.** |  | **1/1** |

**Key Concepts: Key Vocabulary:**

TOPIC:

**Systems of Equations and Inequalities**

The solution of a system of equations can be found by graphing the equations and determining at what point they intersect.

Solve the system of inequalities:



Solve by graphing:



Solve algebraically:



Solve the system:



**Examples:**

The solution to a system of inequalities is found by graphing the inequalities and determining the intersection of the graphs.

Solve systems of inequalities by graphing the inequalities and determining the intersection of the graphs.

Systems of equations can be solved algebraically using either the substitution or elimination.

In the substitution method, one equation is solved for a variable and substituted to find the value of another variable.

In the elimination method, one variable is eliminated by adding or subtracting the equations.

Bounded

Consistent

Elimination method

Inconsistent

Ordered triple

Substitution method

System of equations

System of inequalities

Unbounded

**Enduring Understanding:**

A system of equations allows us to solve problems where there are two or more unknowns.

**Essential Question(s):**

What are the different methods for solving a system of equations or inequalities, and when would you use each method?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Matrices** | | | | | | | Semester this  will be taught: **1** |
| **Enduring Understanding:** Real world data can be organized into a matrix. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 3: Algebraic Representations** | ***PO 4. Use matrices to represent everyday problems that involve systems of linear equations.*** |  | **1/1** | How could you use a matrix to solve a system of equations? |  | Ch 4.1 – 4.6  including ext Ch 4.6 |  |
| ***PO 9. Use matrix operations and the inverse of a matrix to solve problems.*** |  | **1/1** |
| **Strand 2: Data Analysis, Probability, and Discrete Mathematics**  **Concept 1: Data Analysis** | ***PO 9. Use matrices to organize and represent data.*** |  | **1/1** |

**Key Concepts: Key Vocabulary:**

State the dimensions and find the value of 



Two matrices can be multiplied if and only if the number of columns in the first matrix is equal to the number of rows in the second matrix.

Find the determinant and inverse if it exists:



**Examples:**

**Essential Question(s):**

How could you use a matrix to solve a system of equations?

**Enduring Understanding:** Real world data can be organized into a matrix.

A matrix is a rectangular array of variables or constants in horizontal rows and vertical columns.

Matrices can be added or subtracted if they have the same dimensions. Add or subtract corresponding elements.

To multiply a matrix by a scalar k, multiply each element in the matrix by k.

An identity matrix is a square matrix with ones on the diagonal and zeros in the other positions.

If the determinant of a matrix is zero, then the matrix does not have an inverse.

Coefficient matrix

Column matrix

Constant matrix

Determinant

Row

Column

Scalar

Inverse

Matrix

Row matrix

Variable matrix

TOPIC:

**Matrices**

Given: 

And 

Find 

Use a matrix to solve the system:



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Quadratic Functions and Relations** | | | | | | | Semester this  will be taught: **1** |
| **Enduring Understanding:** Graphing a relationship allows us to model real world situations and visualize the relationship between two variables. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 1: Number Sense and Operations**  **Concept 2: Numerical Operations** | ***PO 1. Explore different forms of complex numbers; determine if the properties of the real number system extend to complex numbers and matrices.*** |  | **1/1** | How are the solutions of an equation related to the graph of a function?  What is the relationship between the graph, the equation, and the table of values? |  | Ch 5.1 – 5.7 and Ch 10.3 (circles)  Including ext 5.1, 5.2, 5.7, 5.8    Ch 5.8 is optional |  |
| ***PO 2. Perform computations with complex numbers.*** |  | **1/1** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 2: Functions and Relationships** | ***PO 1. Express and solve problems that can be modeled using linear, quadratic, logarithmic, exponential, cubic, reciprocal, absolute value, and step and other piecewise-defined functions; interpret their solutions in terms of the context.***  ***PO 6. Graph polynomial functions identifying their key characteristics***  ***PO 7. Find domain, range, intercepts, zeros, asymptotes, and points of discontinuity of functions.*** |  | **1/1** |
| **Concept 3: Algebraic Representations**  **Concept 4: Analysis of Change** | ***PO 7. Find complex solutions for quadratic equations.***  ***PO 2. Identify patterns in a function’s rate of change, including intervals of increase, decrease, and constancy; if possible, relate them to the function’s verbal description or its graph.*** |  | **1/1** |
| **Strand 4: Geometry and Measurement**  **Concept 2: Transformation of Shapes** | ***PO 1. Describe how changing the parameters of a quadratic function affects the shape and position of its graph (f(x) = a(x-h)2+k).*** |  | **1/1** |

**Key Concepts: Key Vocabulary:**

The imaginary unit, i, is equal to , and .



Find the center and radius of the circle:

Identify the maximum or minimum of



The real numbers are a subset of the complex numbers.

Roots of a quadratic equation are the zeros of the related quadratic function. You can find the real zeros of a quadratic function by finding the x-intercepts of the graph.

Find all solutions, real and complex:



**Examples:**

**Essential Question(s):**

How are the solutions of an equation related to the graph of a function?

What is the relationship between the graph, the equation, and the table of values?

**Enduring Understanding:** Graphing a relationship allows us to model real world situations and visualize the relationship between two variables.

The graph of opens up when a > 0, and opens down when a < 0.



Quadratic equations can be solved using factoring, the quadratic formula, completing the square, and graphing.

The equation of a circle in standard form can be obtained by completing the square on the expanded form of the equation.

Axis of symmetry

Complex conjugate

Complex number

Discriminant

Maximum value

Minimum value

Parabola

Quadratic formula

Root

Standard form

Vertex

Vertex form

Zero

TOPIC:

**Quadratic Functions and Relations**

Find the value of the discriminant: 

Solve by factoring, complete square, or quadratic formula:



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Polynomials and Polynomial Functions** | | | | | | | Semester this  will be taught: **2** |
| **Enduring Understanding:** Every polynomial function has exactly the number of roots as its degree. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 2: Functions and Relationships** | ***PO 1. Express and solve problems that can be modeled using linear, quadratic, logarithmic, exponential, cubic, reciprocal, absolute value, and step and other piecewise-defined functions; interpret their solutions in terms of the context.*** |  | **2/2** | When can synthetic division be used instead of long division on polynomials?  How are the real zeros of the function related to the solutions of the equation? |  | Ch 6.1 – 6.7 including Ext 6.3, 6.4  Ch 6.8 (optional) |  |
| ***PO 2. Use function notation flexibly and evaluate a function at a value represented by an algebraic expression.*** |  | **2/2** |
| ***PO 7. Find domain, range, intercepts, zeros, asymptotes, and points of discontinuity of functions.*** |  | **2/2** |
| **Concept 3: Algebraic Representations** | ***PO 2. Apply the laws of exponents including rational and negative exponents to rewrite expressions in alternative forms***. |  | **2/2** |
| ***PO 6. Divide a polynomial by a lower degree polynomial.*** |  | **2/2** |
| ***PO 8. Describe the relationships among the solutions of an equation, the zeros of a function, the x-intercepts of a graph, and the factors of a polynomial expression with and without technology.*** |  | **2/2** |
| **Concept 4: Analysis of Change** | ***PO 2. Identify patterns in a function’s rate of change, including intervals of increase, decrease, and constancy; if possible, relate them to the function’s verbal description or its graph.***  ***PO 4. Compare relative magnitudes of functions and their rates of change*** |  | **2/2** |

**Key Concepts: Key Vocabulary:**

TOPIC:

**Polynomials and Polynomial Functions**

You can use long division to divide polynomials.

You can use synthetic division to divide a polynomial by a first degree binomial.

How is the graph of



Related to the graph of





**Examples:**

**Essential Question(s):**

When can synthetic division be used instead of long division on polynomials?

How are the real zeros of the function related to the solutions of the equation?

**Enduring Understanding:**

Every polynomial function has exactly the number of roots as its degree.

Polynomials can be added or subtracted by combining like terms.

Polynomials can be multiplied by using the distributive property.

Turning points of a function are its relative extrema.

The binomial is a factor of the polynomial f(x) if and only if



If is a zero of a function, the is also a zero.



Degree of polynomial

Depressed polynomial

End behavior

Extrema

Leading coefficient

Polynomial function

Factor, remainder theorems

Rational (root) zero theorem

Relative maximum

Relative minimum

Synthetic division

Turning points

Zeros

List all zeros.



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Inverses & Radical Functions and Relations** | | | | | | | Semester this  will be taught: **2** |
| **Enduring Understanding:** Composition of functions can be used to verify that two functions are inverses of each other. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 2: Functions and Relationships** | ***PO 10. Given a function***   * ***find the inverse of the function,*** * ***determine whether the inverse is a function,*** * ***explain why the graph of a function and its inverse are reflections of each other over the line y = x.*** |  | **2/2** | How are a function and its inverse related?  What is the connection between radical expressions and rational exponential expressions?  When does a function have an inverse? |  | Ch 7.1,  Ch 7.2,  Ch 7.4,  Ch 7.5,  Ch 7.6 ext 7.2  Ch 7.3 and Ch 7.7 optional |  |
| ***PO 14. Combine functions by composition, as well as by addition, subtraction, multiplication, and division including any necessary restrictions on the domain.*** |  | **2/2** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 3: Algebraic Representations** | ***PO 2. Apply the laws of exponents including rational and negative exponents to rewrite expressions in alternative forms***. |  | **2/2** |
| ***PO 5. Simplify radical expressions by performing operations on them.*** |  | **2/2** |

**Key Concepts: Key Vocabulary:**

TOPIC:

**Inverses, Radical Functions and Relations**



For :



if n is even, and b < 0, no real roots.

If n is odd, and b <0, real roots exist.

Reverse the coordinates of the ordered pairs to find the inverse of a function.

A function has an inverse if and only if it is 1-1.

Find the inverse of



Simplify:





**Examples:**

**Essential Question(s):**

How are a function and its inverse related?

What is the connection between radical expressions and rational exponential expressions?

When does a function have an inverse?

**Enduring Understanding:**

Composition of functions can be used to verify that two functions are inverses of each other.

Functions can be added, subtracted, multiplied and divided.

The composition of two functions is evaluating one function with another function.

Composition of functions

Conjugate

Extraneous solutions

Inverse function

Index

Nth root

Principal root

Radical equation

Radicand

Rationalize the denominator

Given: 

Find 

Solve:



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Exponential and Logarithmic Functions and Relations** | | | | | | | Semester this  will be taught: **2** |
| **Enduring Understanding:** Logarithms are used to solve for unknown values that are exponents. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 2: Functions and Relationships** | ***PO 1. Express and solve problems that can be modeled using linear, quadratic, logarithmic, exponential, cubic, reciprocal, absolute value, and step and other piecewise-defined functions; interpret their solutions in terms of the context.*** |  | **2/2** | How do you perform numerical operations involving exponents and logarithms?  How do you simplify expressions involving logs?  How are the exponential and log form of an expression related? |  | Ch 8.1 – 88  Including exts  Ch 8.2, 8.6 and Explore  Ch 8.8 |  |
| ***PO 2. Use function notation flexibly and evaluate a function at a value represented by an algebraic expression.*** |  | **2/2** |
| ***PO 4. Graph exponential functions identifying their key characteristics*** |  | **2/2** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 3: Algebraic Representations** | ***PO 1. Rewrite and describe the need for equivalent forms of algebraic expressions.*** |  | **2/2** |
| **Strand 4: Geometry and Measurement**  **Concept 2: Transformation of Shapes** | ***PO 2. Describe how changing the parameters of an exponential function affects the shape and position of its graph (f(x) = abx).*** |  | **2/2** |

**Key Concepts: Key Vocabulary:**

TOPIC:

**Exponential and Logarithmic Functions and Relations**

Graph, state domain and range:





Solve:



**Examples:**

**Essential Question(s):**

How do you perform numerical operations involving exponents and logarithms?

How do you simplify expressions involving logs?

How are the exponential and log form of an expression related?

**Enduring Understanding:**

Logarithms are used to solve for unknown values that are exponents.

Exponential functions can model growth or decay.

If then, x = y.



To change the base of a log expression use:



“e” is the natural base.

Asymptote

Base

Change of base formula

Common logarithm

Compound interest

Decay

Growth

Logarithm

Natural base, e

Assume the cost of bread is $4 per loaf with continuous compounding, find the time it would take for the cost to triple at an annual inflation rate of 6%.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Rational Functions and Relations** | | | | | | | Semester this  will be taught: **2** |
| **Enduring Understanding:** The asymptotes of a rational function can be used to draw its graph, and to describe its domain. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 2: Functions and Relationships** | ***PO 1. Express and solve problems that can be modeled using linear, quadratic, logarithmic, exponential, cubic, reciprocal, absolute value, and step and other piecewise-defined functions; interpret their solutions in terms of the context.*** |  | **2/2** | How do you simplify rational expressions?  What pieces of information do you need to know to graph a rational function?  What is a rational expression? An asymptote? |  | Ch 9.1 – 9.6  Including  Ext 9.6 |  |
| ***PO 7. Find domain, range, intercepts, zeros, asymptotes, and points of discontinuity of functions.*** |  | **2/2** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 3: Algebraic Representations** | ***PO 1. Rewrite and describe the need for equivalent forms of algebraic expressions.*** |  | **2/2** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 4: Analysis of Change** | ***PO 2. Identify patterns in a function’s rate of change, including intervals of increase, decrease, and constancy; if possible, relate them to the function’s verbal description or its graph*** |  | **2/2** |
| Strand 4: Geometry and Measurement  **Concept 3: Coordinate Geometry** | ***PO 2. Determine an equation of a circle given its center and radius; given an equation of a circle, find its center and radius.*** |  |  |  |  |

**Key Concepts: Key Vocabulary:**

Solve:



**Examples:**

**Essential Question(s):**

**How can you clear fraction from a rational equation?**

How do you simplify rational expressions?

What pieces of information do you need to know to graph a rational function?

What is a rational expression? An asymptote?

**Enduring Understanding:**

The asymptotes of a rational function can be used to draw its graph, and to describe its domain.

Multiplying and dividing rational expressions is similar to multiplying and dividing fractions.

To simplify complex fractions, simplify the numerator and the denominator separately, and then simplify the resulting fraction.

Eliminate fractions in rational equations by multiplying each side of the equation by the L.C.D.

Possible solutions of a rational equation must exclude values that result in zero in the denominator.

Asymptotes

Variation

Complex fraction

Point discontinuity

Rational function

Reciprocal function

TOPIC:

**Rational Functions and Relations**

Solve: 



Given:



Find the domain, range, any asymptotes, and graph.

Simplify:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Sequences and Series** | | | | | | | Semester this  will be taught: **2** |
| **Enduring Understanding:** Arithmetic sequences are related to linear functions, and geometric sequences are related to exponential functions. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 2: Data Analysis, Probability, and Discrete Mathematics**  **Concept 3: Systematic Listing and Counting** | ***PO 1. Use the binomial theorem and Pascal’s Triangle to solve problems.*** |  | **2/2** | How are sequences and series different from each other?  What are the different ways to find the sum of a series? |  | Ch 11.1- 11.7  Ext 11.6  Optional – Ch 11.4 |  |
| ***PO 2. Demonstrate the connections between the binomial coefficients, entries of Pascal's triangle, and combinations.*** |  | **2/2** |
| **Strand 3: Patterns, Algebra, and Functions**  **Concept 1: Patterns** | ***PO 1. Analyze sequences and series and use them in modeling, including***   * ***explicit formulas for nth terms,*** * ***sums of finite arithmetic series, and*** * ***sums of finite geometric series.*** |  | **2/2** |
| ***PO 3. Distinguish between explicit and recursive formulas and convert between them, making good choices about when to use which.*** |  | **2/2** |
| ***PO 4. Solve problems involving recursion.*** |  | **2/2** |
| ***PO 5. Use and interpret sigma notation to represent summation.*** |  | **2/2** |
| **Strand 5: Structure and Logic**  **Concept 1: Algorithms and Algorithmic Thinking** | ***PO 1. Use a variety of approaches (inductive and deductive reasoning, estimations, generalizations, formal and informal methods of proof) to analyze algorithms.*** |  | **2/2** |
|  | See ***Structure and Logic*** portion of the curriculum document for connections to higher order thinking and teaching for understanding rather than teaching solely for skill development. |  | **2/2** |

**Key Concepts: Key Vocabulary:**

Find the first five terms of the sequence in which



The binomial theorem is:



In a recursive formula, each term is generated from one or more previous terms.

The sum of the first n terms of an arithmetic series is given by



The sum of the first n terms of a geometric series is given by



= where



The *n*th term of a geometric sequence with first term and common ratiojn r is given by where n is any positive integer.



The *n*th term, of an arithmetic sequence with first term and common difference d is given by



+ (n-1) d where n is any positive integer.



Find the sum of the geometric series:



Expand using the binomial theorem:



Find the sum of the arithmetic series:



**Examples:**

**Essential Question(s):**

How are sequences and series different from each other?

What are the different ways to find the sum of a series?

**Enduring Understanding:**

Arithmetic sequences are related to linear functions, and geometric sequences are related to exponential functions.

Arithmetic

Common difference

Common ratio

Explicit formula

Finite sequence

Geometric

induction

infinite sequence

iteration

Pascal’s triangle

Recursive

Sigma notation

Term

TOPIC:

**Sequences and Series**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: Probability and Statistics** | | | | | | | Semester this  will be taught: **2** |
| **Enduring Understanding:** The likelihood of an event happening can be described in terms of probability. Statistical analysis can be used to interpret data. | | | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | **EIN** | Semester  **I/B** | **Essential Questions** | **Assessments** | **Resources**  Ch=Chapter  L=Lesson | **Collaboration and Integration** |
| **Strand 1: Number and Operations**  **Concept 3: Estimation** | ***PO 1. Recognize the limitations of estimations by assessing the amount of error resulting from estimation and determining whether the error is within acceptable tolerance limits.*** |  | **2/2** | What is a normal distribution?  What is the difference between a biased sample and an unbiased sample?  What is conditional probability? |  | Ch 12.1 – 12.7  Including ext 12.1 |  |
| **Strand 2: Data Analysis, Probability, and Discrete Mathematics**  **Concept 1: Data Analysis** | ***PO 2. Compare data sets using graphs and summary statistics, including variance and standard deviation, with or without technology.*** |  | **2/2** |
| **Strand 2: Data Analysis, Probability, and Discrete Mathematics**  **Concept 2: Probability** | ***PO 1. Apply probability concepts to calculate the probability of events and to make informed decisions in practical situations*** |  | **2/2** |
| ***PO 2. Use the principal characteristics of the normal distribution to estimate probabilities.*** |  | **2/2** |
| ***PO 4. Determine the conditional probability of an event given that another event occurs, decide if two events are dependent or independent, and determine the probability of an event given the probability of the complementary event.*** |  | **2/2** |
| **Strand 2: Data Analysis, Probability, and Discrete Mathematics**  **Concept 3: Systematic Listing and Counting** | ***PO 2. Demonstrate the connections between the binomial coefficients, entries of Pascal's triangle, and combinations.*** |  | **2/2** |
| **Strand 5: Structure and Logic**  **Concept 2: Logic, Reasoning, Problem Solving, and Proof** | ***PO 6. Synthesize mathematical information from multiple sources to draw a conclusion, make inferences based on mathematical information, evaluate the conclusions of others, analyze a mathematical argument, and recognize flaws or gaps in reasoning.*** |  | **2/2** | Ch 12.1, ext 12.1 |

**Key Concepts: Key Vocabulary:**

**Enduring Understanding:**

The likelihood of an event happening can be described in terms of probability.

Statistical analysis can be used to interpret data.

Probability

Normal distribution

Measures of central tendency

Margin of error

Experiment

Correlation

Conditional probability

Binomial distribution

Biased

A normal distribution of data has a mean of 78 and a standard deviation of 5. Find the probability that a random value x is greater than 83.

A student gets a hit 65% of times she is at bat. What is the probability that she does not get a hit in five consecutive at bats?

Find a 95% confidence interval for



S = 1.5 and n = 100.

**Examples:**

**Essential Question(s):**

What is a normal distribution?

What is the difference between a biased sample and an unbiased sample?

What is conditional probability?

You can use the correlation coefficient to determine if a relationship exists between two sets of data.

A sample is biased if its design favors certain outcomes.

A sample is unbiased if it is random or unpredictable.

Standard deviation is the square root of the variance represented by *a*.

The graph of a normal distribution is a symmetric, bell shaped curve.

The probability of an event given that another event has already occurred is the conditional probability.

Sample

Standard deviation

Survey

Unbiased

TOPIC:

**Probability and Statistics**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **TOPIC: All Chapters Structure and Logic** | | | | | Semester this  will be taught: **2** | |
| **Enduring Understanding:** | | | | |
| **Standard and**  **Related Concept** | **Performance Objectives** | Semester  **I/B** | **Essential Questions** | **Resources**  Ch=Chapter  L=Lesson | | **Collaboration and Integration** | |
| **Strand 5: Structure and Logic**  **Concept 1: Algorithms and Algorithmic Thinking** | ***PO 1. Use a variety of approaches (inductive and deductive reasoning, estimations, generalizations, formal and informal methods of proof) to analyze algorithms.*** | **2/2** |  | Ch 1.1 | |  | |
| **Strand 5: Structure and Logic**  **Concept 2: Logic, Reasoning, Problem Solving, and Proof** | ***PO 1. Analyze a problem situation, determine the question(s) to be answered, organize given information, determine how to represent the problem, and identify implicit and explicit assumptions that have been made.*** | **2/2** | Ch 1.2 | |
| ***PO 2. Solve problems by using theorems, formulating one or more strategies, applying the strategies, verifying the solution(s), and communicating the reasoning used to obtain the solution(s).*** | Ch 1.3 | |
| Ch 1.1 | |
| ***PO 3. Evaluate a solution for***  ***reasonableness and interpret the meaning of the solution in the context of the original problem.*** |
| **PO 4. Generalize a solution strategy for a single problem to a class of related problems and explain the role of generalizations in inductive and deductive reasoning.** | Ch 1.6 | |
| Ch 1.2,1.4,1.5 | |
| ***PO 5. Summarize and communicate mathematical ideas using formal and informal reasoning.*** |
| **Strand 5: Structure and Logic**  **Concept 2: Logic, Reasoning, Problem Solving, and Proof** | **PO 6. Synthesize mathematical information from multiple sources to draw a conclusion, make inferences based on mathematical information, evaluate the conclusions of others, analyze a mathematical argument, and recognize flaws or gaps in reasoning.** | **2/2** | Ch 1/2 | |
| ***PO 7. Analyze and explain the general properties and behavior of functions or relations using algebraic and graphing techniques*** | **2/2** |
| **PO 8.** **Use inductive and deductive reasoning to make, analyze, and validate or refute conjectures and/or proofs.** | **2/2** |